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Other: **On-line - EPODOC, INSPEC, WPI**(54) Abstract Title: **Transmitting MAC address during SIP registration**

(57) A Session Initiation Protocol (SIP) based Voice over Internet Protocol (VoIP) system comprises a SIP terminal (100, fig.5) and a SIP call server (200, fig.5). Upon receipt of a first registration request message from the SIP terminal, the call server transmits a user information request message to the SIP terminal to request a Media Access Control (MAC) address of the SIP terminal, and upon receipt of a second registration request message including the MAC address from the SIP terminal, the call server registers the SIP terminal and stores the MAC address to be matched to the registered SIP terminal, and then transmits a response message to the SIP terminal confirming completion of the registration. In the second registration request message, the MAC address may be appended to the user_name of an "Authenticate" Field and may be obtained by subtracting the user_name of the first message from the second message. An identifier in a nonce of a "WWW-Authenticate" field may be included in the user information request message to indicate to the SIP terminal that its MAC address is requested.

FIG. 4

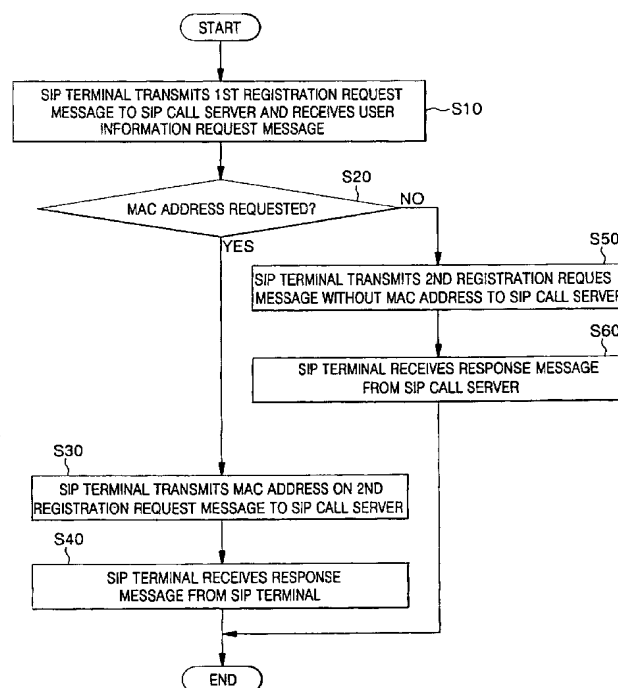


FIG. 1

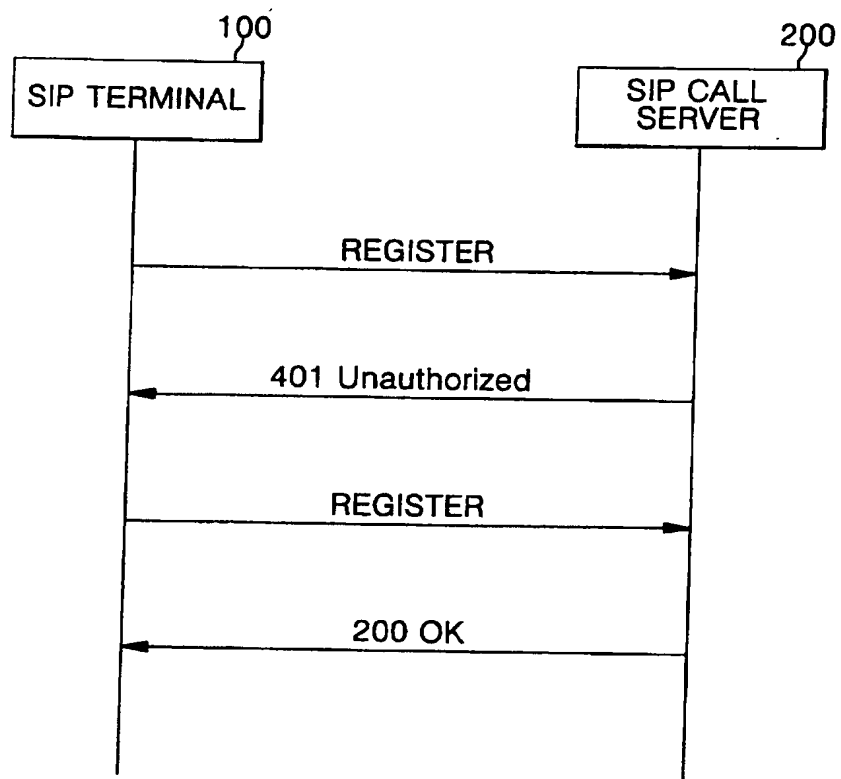


FIG. 2

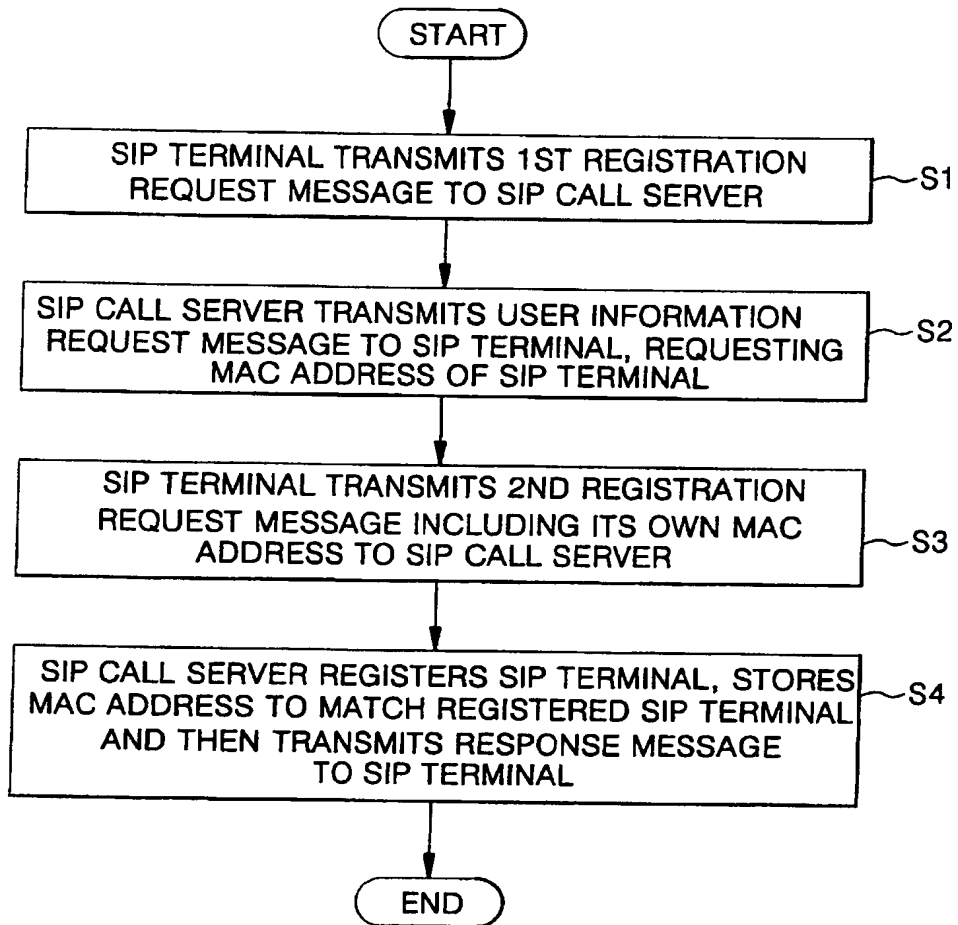


FIG. 3

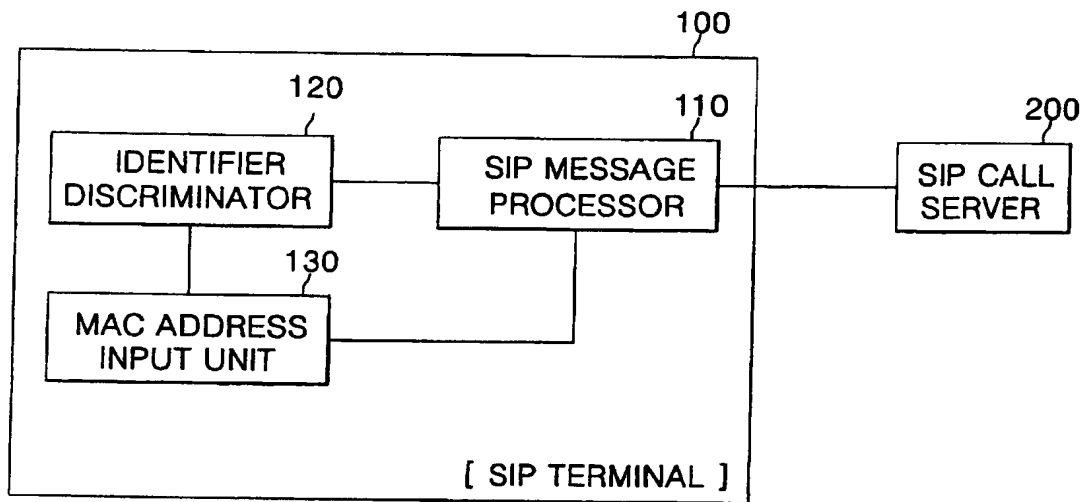


FIG. 4

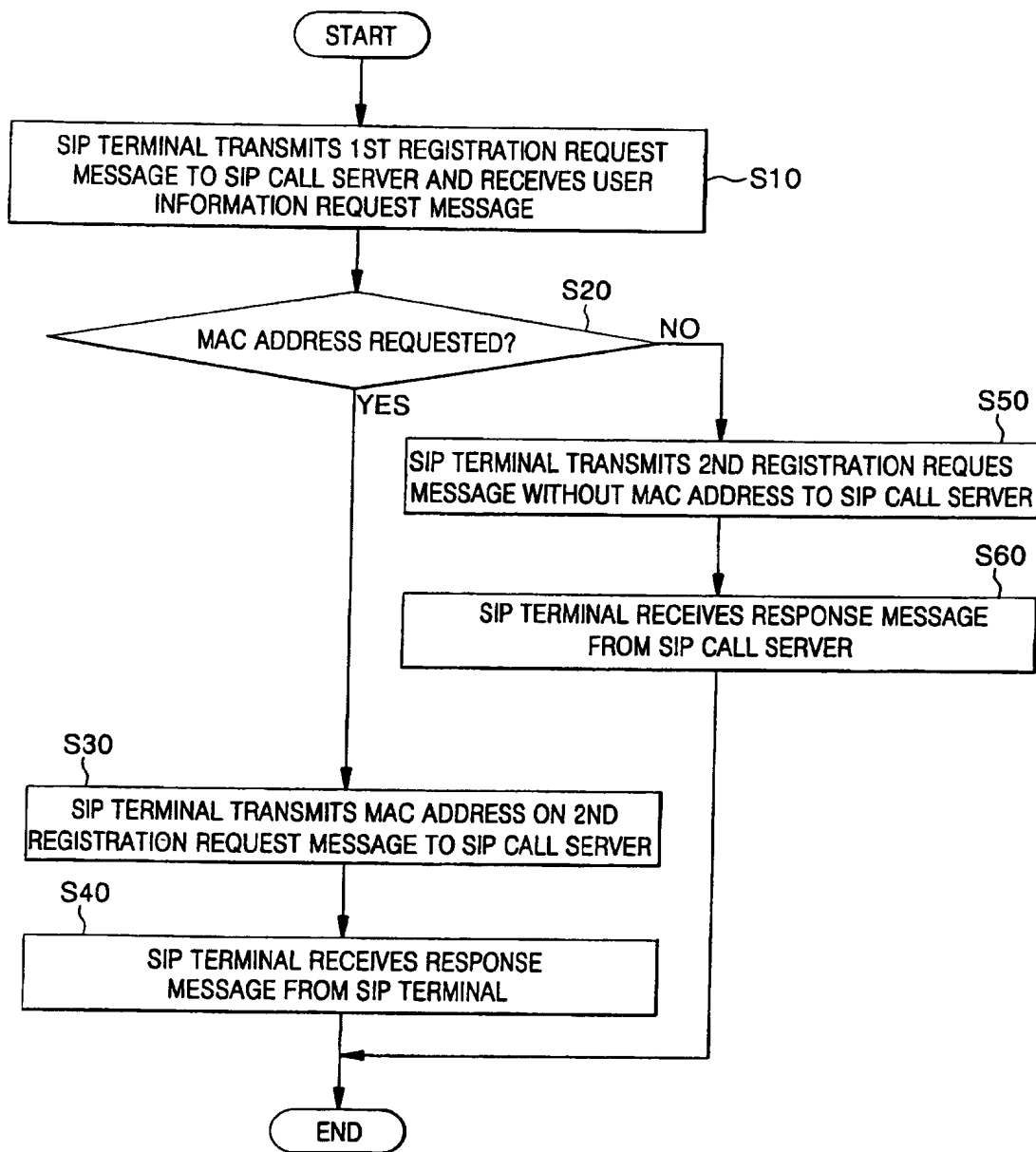


FIG. 5

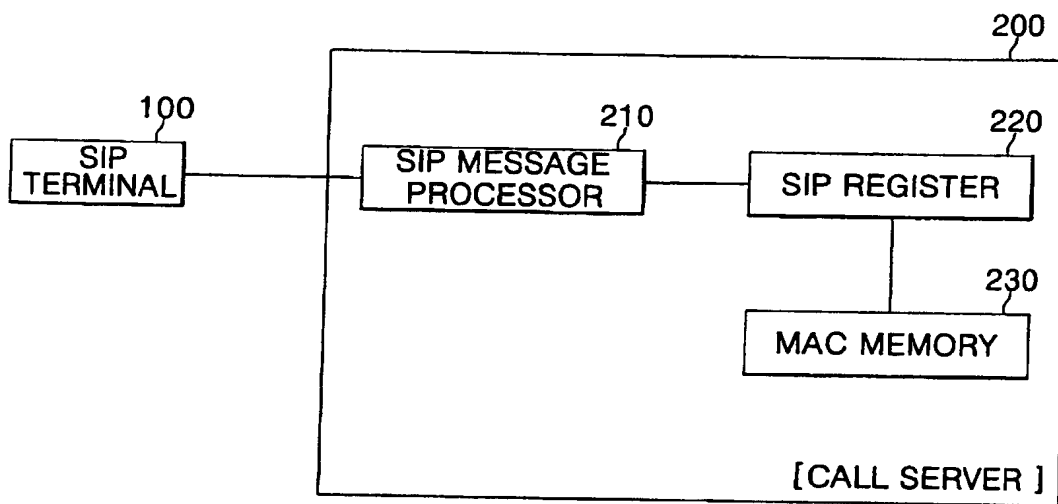


FIG. 6

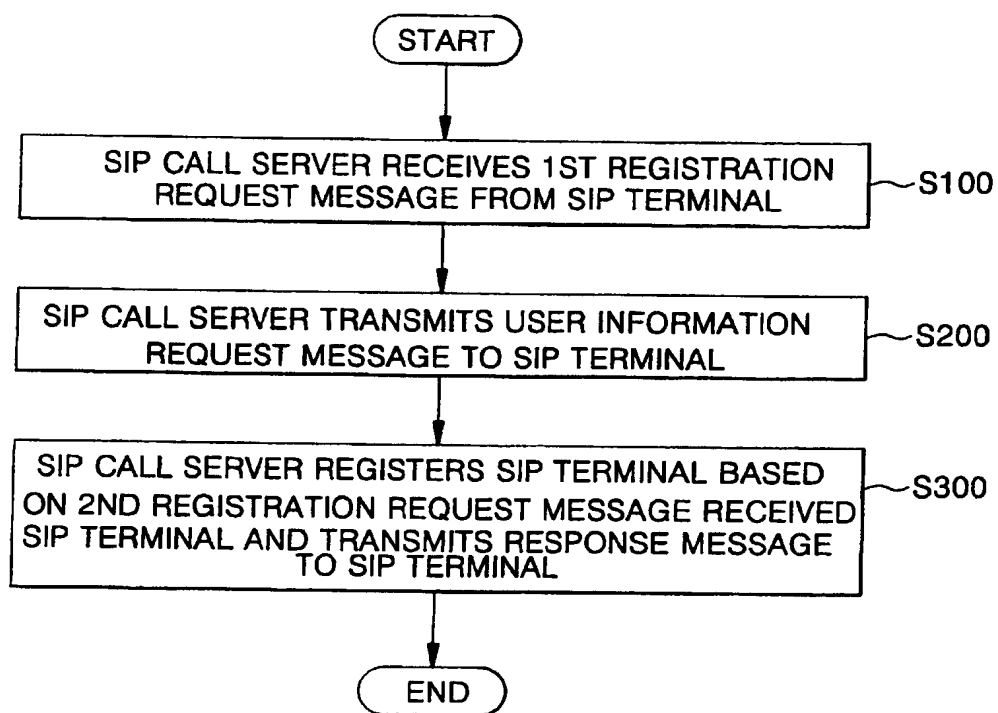


FIG. 7

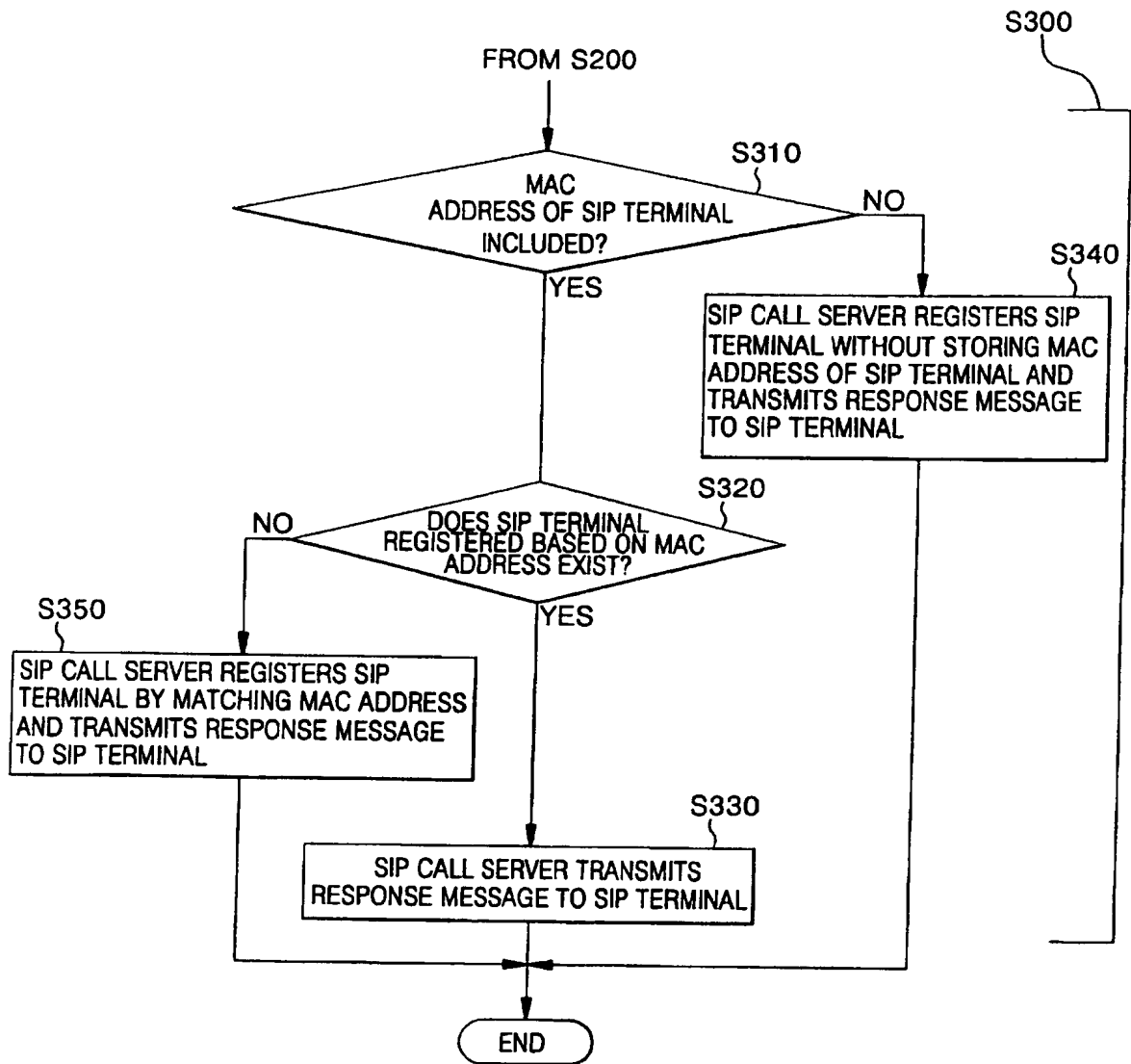


FIG. 8A

F1: REGISTER User A -> SIP Server

```
REGISTER sip:samsung.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
From: LittleGuy <sip:UserA@there.com>
To: LittleGuy <sip:UserA@there.com>
Call-ID: 123456789@there.com
CSeq: 1 REGISTER
Contact: <sip:UserA@110.111.112.113>
Contact: <sip:+1-972-555-2222@gw1.wcom.com;user=phone>
Contact: tel:+1-972-555-2222
Content-Length: 0
```

FIG. 8B

F2: 401 Unauthorized SIP Server -> User A

```
SIP/2.0 401 Unauthorized
Via: SIP/2.0/UDP there.com:5060
From: LittleGuy <sip:UserA@there.com>
To: LittleGuy <sip:UserA@there.com>
Call-ID: 123456789@there.com
CSeq: 1 REGISTER
WWW-Authenticate: Digest realm="Samsung OfficeServ SIP",
    domain="sip:samsung.com", nonce="mac-c8e88df84f1cec4341ae6cbe5a35",
    opaque="", stale=FALSE, algorithm=MD5
Content-Length: 0
```



FIG. 8C

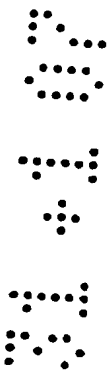
F3: REGISTER User A -> SIP Server

```
REGISTER sip:samsung.com SIP/2.0
Via: SIP/2.0/UDP there.com:5060
From: LittleGuy <sip:UserA@there.com>
To: LittleGuy <sip:UserA@there.com>
Call-ID: 123456789@there.com
CSeq: 2 REGISTER
Contact: <sip:UserA@110.111.112.113>
Contact: <sip:+1-972-555-2222@gw1.wcom.com;user=phone>
Contact: tel:+1-972-555-2222
Authorization: Digest username="UserA000447681cdd",
  realm="Samsung OfficeServ SIP",
  nonce="mac-c8e88df84f1cec4341ae6cbe5a35", opaque="",
  uri="sip:samsung.com", response="dfe56131d1958046689cd83306477ecc"
Content-Length: 0
```

FIG. 8D

F4: 200 OK SIP Server -> User A

```
SIP/2.0 200 OK
Via: SIP/2.0/UDP there.com:5060
From: LittleGuy <sip:UserA@there.com>
To: LittleGuy <sip:UserA@there.com>
Call-ID: 123456789@there.com
CSeq: 2 REGISTER
Contact: <sip:UserA@110.111.112.113>;expires=3600
Contact: <sip:+1-972-555-2222@gw1.wcom.com;user=phone>;expires=3600
Contact: <tel:+1-972-555-2222>;expires=4294967295
Content-Length: 0
```



SESSION INITIATION PROTOCOL (SIP) BASED VOICE OVER INTERNET PROTOCOL (VoIP) SYSTEM AND METHOD OF REGISTERING SIP TERMINAL THEREIN

5

The present invention relates to a Session Initiation Protocol (SIP) based Voice over Internet Protocol (VoIP) system and a method of registering an SIP terminal therein.

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The SIP is a type of signal protocol designed for establishing/terminating sessions in an Internet Protocol (IP) network. It is well known as a VoIP telephone standard to locate and connect terminal users to a multi-group voice and video conference. Like the HyperText Transfer Protocol (HTTP), the SIP is versatile and convenient to use. The Internet Engineering Task Force (IETF) published RFC 2543 as the first version of the SIP in 1999, and more recently published RFC 3261 as the latest version of the SIP in June 2002.

15

While the SIP can adopt a User Datagram Protocol (UDP) or a Transmission Control Protocol (TCP) as a transfer means, it generally uses UDP in port 5060 as a reference value. When an SIP packet is lost owing to an unreliable protocol such as UDP, the SIP determines whether or not it has waited for a response for a sufficient time period, and then retransmits a command.

20

An SIP terminal generally uses a command "REGISTER" to be registered in a server. The SIP terminal transmits the "REGISTER" command to an SIP call server in order to register itself in the SIP call server.

25

Then, the SIP call server transmits a "401 Unauthorized" message to the SIP terminal. The "401 Unauthorized" message is a message requesting, for example, a user ID, password, nonce and domain of a "WWW-Authenticate" field.

A nonce is a parameter that varies with time. A nonce can be a time stamp, a visit counter on a Web page, or a special marker intended to limit or prevent the unauthorized replay or reproduction of a file. Because a nonce changes with time, it is easy to tell whether or not an attempt at replay or reproduction of a file is legitimate. That is, the current time can be compared with the nonce. If it does not exceed it or if no nonce exists, then the attempt is authorized. Otherwise, the attempt is not authorized.

Upon having received the "401 Unauthorized" message from the SIP call server, the SIP terminal transmits a user ID, password, nonce, domain and the like on a second "REGISTER" message to the SIP call server.

Then, the SIP call server performs an authentication in an MD5 mode to register the SIP terminal. That is, the SIP call server performs a registration through the user ID, password, nonce and domain of the SIP terminal from the "REGISTER" message transmitted from the SIP terminal as a method of registering the SIP terminal in a VoIP system based on the SIP (see RFC 3261).

Then, the SIP call server transmits a "200 OK" response message to the SIP terminal, completing the registration of the SIP terminal.

The use of a proxy server requires a register server. For example, when a telecommunication worker makes a connection to a VoIP telephone, the telephone sends a counterpart location to the register server. Several telephones can be registered by a single register server if there is an SIP gateway available in case of calling.

However, a conventional registration of a terminal in an SIP based VoIP system has drawbacks. That is, at self-initialization and thus re-registration of a previously registered terminal, if its authentication key is not identical, a new authentication key must be inconveniently generated again for re-registration.

Furthermore, when the IP of the terminal is changed, it is difficult to identify the terminal in case of a registration request and thus, registration errors can occur.

It is an aim the present invention to at least mitigate the above-referenced problems.

5 It is an aim of embodiments of the present invention to provide a Session Initiation Protocol (SIP) based Voice over Internet Protocol (VoIP) system and a method of registering an SIP terminal therein, which can simplify and strengthen an authentication process by utilizing a Media Access Control (MAC) address when registering a terminal in the system.

10 According to one aspect of the present invention, a Session Initiation Protocol (SIP) based Voice over Internet Protocol (VoIP) system is provided, the system including: an SIP call server and an SIP terminal; the SIP call server adapted to transmit a user information request message to the SIP terminal to request a Media Access Control (MAC) address of the SIP terminal upon receipt of a first registration
15 request message from the SIP terminal and to register the SIP terminal and store the MAC address to be matched to the registered SIP terminal upon receipt of a second registration request message including the MAC address from the SIP terminal, and to transmit a response message to the SIP terminal; and the SIP terminal adapted to analyze the user information request message to determine
20 whether or not to request the MAC address upon receipt of the user information request message after transmission of the first registration request message, and to transmit the MAC address thereof on the second registration request message to the SIP call server.

The second registration request message is preferably adapted to add the
25 MAC address thereof to a user_name of an "Authenticate" field.

The user information request message preferably includes an identifier in a nonce of a "WWW-Authenticate" field.

According to a second aspect of the present invention, a Session Initiation Protocol (SIP) terminal of an SIP based Voice over Internet Protocol (VoIP) system is provided, the terminal including an SIP registration module adapted to transmit a first registration request message to an SIP call server upon receipt of a user information request message that requests a Media Access Control (MAC) address of an SIP terminal, to transmit a second registration request message including the MAC address of the SIP terminal to the SIP call server, and to receive a response message therefrom to complete SIP terminal registration.

The SIP registration module preferably includes: an SIP message processor adapted to transmit the first and second registration request messages to the SIP call server and to receive the user information request message and the response message from the SIP call server; an identifier discriminator adapted to determine whether or not the user information request message received from the SIP call server has the MAC address of the SIP terminal; and a MAC address input unit adapted to add the MAC address of the SIP terminal to the second registration request message upon an identifier existing in the user information request message.

The second registration request message preferably includes the MAC address of the SIP terminal in a user_name of an "Authenticate" field.

The user information request message preferably includes an identifier in a nonce of a "WWW-Authenticate" field.

According to a third aspect of the present invention, a Session Initiation Protocol (SIP) call server of an SIP based Voice over Internet Protocol (VoIP) system is provided, the server including an SIP registration module adapted to transmit a user information request message to an SIP terminal to request a Media Access Control (MAC) address of the SIP terminal upon receipt of a first registration message from the SIP terminal, to register the SIP terminal while storing the MAC

address to be matched to the registered SIP terminal upon receipt of a second registration message from the SIP terminal including the MAC address of the SIP terminal, and to transmit a response message to the SIP terminal.

The SIP registration module preferably includes: an SIP message processor
5 adapted to transmit the user information request message to the SIP terminal upon receipt of the first registration message from the SIP terminal, to extract user information and the MAC address of the SIP terminal upon receipt of the second registration message from the SIP terminal including the MAC address, and to transmit the response message to the SIP terminal upon the SIP terminal being
10 authenticated; an SIP register adapted to register the SIP terminal based on the user information of the SIP terminal extracted from the SIP message processor; and a MAC memory adapted to store the MAC address to be matched to an authentication key of the SIP terminal upon authentication of the SIP terminal by the SIP register.

15 The second registration request message preferably includes the MAC address of the SIP terminal in a user name of an "Authenticate" field.

The user information request message preferably includes an identifier in a nonce of a "WWW-Authenticate" field.

According to a fourth aspect of the present invention, a method of registering
20 a Session Initiation Protocol (SIP) terminal in an SIP based Voice over Internet protocol (VoIP) system is provided, the method including: transmitting a first registration request message to an SIP call server from the SIP terminal; transmitting a user information request message to the SIP terminal from the SIP call server, requesting a Media Access Control (MAC) address of the SIP terminal;
25 transmitting a second registration request message including the MAC address thereof to the SIP call server from the SIP terminal; and registering the SIP terminal based on the second registration request message and storing the MAC address to

be matched to the registered SIP terminal in the SIP call server, and transmitting a response message to the SIP terminal.

The user information request message transmitted from the SIP call server to the SIP terminal preferably includes an identifier in a nonce of a "WWW-Authenticate" field in order to acquire the MAC address of the SIP terminal.

The second registration request message transmitted from the SIP terminal to the SIP call server preferably includes the MAC address of the SIP terminal in a user_name of an "Authenticate" field.

According to a fifth aspect of the present invention, a method of registering a Session Initiation Protocol (SIP) terminal in an SIP based Voice over Internet protocol (VoIP) system is provided, the method including: transmitting a first registration request message to an SIP call server and receiving a user information request message therefrom; determining whether or not the SIP call server has requested a Media Access Control (MAC) address of the SIP terminal based on the user information request message received therefrom; transmitting user terminal information including the MAC address of the SIP terminal on a second registration request message to the SIP call server upon a determination that the SIP call server has requested the MAC address of the SIP terminal; and receiving a response message from the SIP call server to complete registration.

The method preferably further includes: transmitting user terminal information without the MAC address of the SIP terminal on the second registration request message to the SIP call server upon a determination that the SIP call server has not requested the MAC address of the SIP terminal; and receiving a response message from the SIP call server to complete registration.

Determining whether or not the SIP call server has requested a MAC address of the SIP terminal preferably includes determining whether or not an identifier is

included in a nonce of a WWW-Authenticate field in the received user information request message.

Transmitting user terminal information preferably includes adding the MAC address of the SIP terminal to a user_hame of an "Authenticate" field.

5 According to a sixth aspect of the present invention, a method of registering a Session Initiation Protocol (SIP) terminal by an SIP call server in an SIP based Voice over Internet Protocol (VoIP) system is provided, the method including: receiving a first registration request message from the SIP terminal; transmitting a user information request message to the SIP terminal, requesting a Media Access
10 Control (MAC) address of the SIP terminal; and registering the SIP terminal based on a second registration request message received from the SIP terminal and storing the MAC address to be matched to the registered SIP terminal, and transmitting a response message to the SIP terminal.

Transmitting a response message to the SIP terminal preferably includes:
15 determining whether or not the MAC address of the SIP terminal is included in the second registration request message received from the SIP terminal; determining whether or not the registered SIP terminal exists based on the MAC address upon the MAC address of the SIP terminal being included in the second registration request message; and transmitting the response message to the SIP terminal upon
20 a determination that the registered SIP terminal has been confirmed as existing.

The method preferably further includes registering the SIP terminal without storing the MAC address of the SIP terminal upon a determination that the MAC address has not been included in the second registration request message, and transmitting the response message to the SIP terminal.

25 The method preferably further includes conducting registration by matching of the MAC address of the SIP terminal upon a determination that the registered SIP terminal does not exist, and transmitting the response message to the SIP terminal.

Transmitting the user information request message to the SIP terminal preferably includes adding an identifier to a nonce of a "WWW-Authenticate" field in the user information request message and transmitting the user information request message in order to acquire the MAC address of the SIP terminal.

- 5 The method preferably further includes confirming the MAC address of the SIP terminal by comparing a user_name of an "Authenticate" field of the first registration request message with that of the second registration request message.

A more complete appreciation of the present invention and many of the attendant advantages thereof, will be readily apparent as the present invention becomes better understood by reference to the following detailed description, given by way of example only, when considered in conjunction with the accompanying drawings in which like reference symbols indicate the same or similar components, wherein:

FIG. 1 is a functional block diagram of a Session Initiation Protocol (SIP) based Voice over Internet Protocol (VoIP) system according to an embodiment of the present invention;

FIG. 2 is a flowchart of a method of registering an SIP terminal in an SIP based VoIP system according to an embodiment of the present invention;

FIG. 3 is a block diagram of an SIP terminal in an SIP based VoIP system according to an embodiment of the present invention;

FIG. 4 is a flowchart of a method of registering an SIP terminal in an SIP based VoIP system according to an embodiment of the present invention;

FIG. 5 is a block diagram of a method of registering an SIP call server in an SIP based VoIP system according to an embodiment of the present invention;

FIG. 6 is a flowchart of a method of registering an SIP terminal by an SIP call server in an SIP based VoIP system according to an embodiment of the present invention;

FIG. 7 is a detailed flowchart of the method of registering an SIP terminal by an SIP call server in an SIP based VoIP system according to the embodiment of the present invention of FIG. 6, including the steps of storing a MAC address to be matched to the SIP terminal;

5 FIG. 8A is a first registration request message that the SIP terminal transmits to the SIP call server in the SIP based VoIP system of any one of FIGS. 1 to 7;

FIG. 8B is a user information request message that the SIP call server transmits to the SIP terminal in the SIP based VoIP system of any one of FIGS. 1 to 7;

10 FIG. 8C is a second registration request message that the SIP terminal transmits to the SIP call server in the SIP based VoIP system of any one of FIGS. 1 to 7, and

FIG. 8D is a response message that the SIP call server transmits to the SIP terminal in the SIP based VoIP system of one of FIGS. 1 to 7.

15 Hereinafter, exemplary embodiments of the present invention are described in detail with reference to the accompanying drawings. Like elements are denoted by like reference numerals throughout the drawings. Matters related to the present invention and well-known in the art have not been described in detail when deemed that such descriptions would detract from the clarity and conciseness of the disclosure.

20 FIG. 1 is a functional block diagram of a Session Initiation Protocol (SIP) based Voice over Internet Protocol (VoIP) system according to an embodiment of the present invention, in which the VoIP system includes an SIP terminal 100 and an SIP call server 200.

25 The SIP terminal 100 receives a user information request message after having transmitted a first registration request message to the SIP call server 200. Then, the SIP terminal analyzes the user information request message, determines

whether or not a Media Access Control (MAC) address has been requested, and if the MAC address has been requested, transmits the MAC address on a second registration request message to the SIP call server 200. Upon receiving a response message from the SIP call server 200, the SIP terminal 100 terminates a registration process. The second registration request message transmitted from the SIP terminal 100 includes the MAC address of the SIP terminal 100 in the user_name of the "Authenticate" field.

When the SIP call server 200 receives the first registration message from the SIP terminal 100, it transmits the user information request message to the SIP terminal 100, requesting the MAC address of the SIP terminal 100. If the second registration message including the MAC address has been received from the SIP terminal 100, the SIP call server 200 registers the SIP terminal 100 while storing the MAC address to be matched to the registered SIP terminal 100. Then, the SIP call server 200 transmits the response message to the SIP terminal 100. In this case, the user information request message transmitted from the SIP call server 200 includes an identifier in the nonce of the "WWW-Authenticate" field.

The SIP call server 200, upon receiving the second registration request message from the SIP terminal 100, determines whether or not the MAC address is present in the second registration request message. If the MAC address is present, the SIP call server 200 authenticates the SIP terminal via MD5 mode while registering the MAC address to be matched to the registered SIP terminal 100.

If the MAC address is absent in the second registration request message, the SIP call server 200 authenticates and registers the SIP terminal 100 by the MD5 mode.

First, the SIP terminal 100 transmits a first registration request message, as shown in FIG. 8A, to the SIP call server 200.

Then, the SIP call server 200 transmits a user information request message to the SIP terminal 100, requesting the MAC address of the SIP terminal 100. In this case, the user information request message transmitted from the SIP call server 200 further includes an identifier in the nonce of the "WWW-Authenticate" field.

5 Then, the SIP terminal 100 analyzes the user information request message to determine whether or not the MAC address has been requested, and if the MAC address has been requested, transmits its own MAC address on a second registration request message to the SIP call server 200. In this case, the second registration request message transmitted from the SIP terminal 100 includes its own
10 MAC address in the user_name of the "Authenticate" field.

Then, the SIP call server 200 determines whether or not the MAC address of the SIP terminal 100 has been included in the second registration request message. If the MAC address of the SIP terminal 100 has been included, the SIP call server 200 registers the SIP terminal 100 while storing the MAC address to be matched to
15 the registered terminal.

After that, the SIP call server 200 transmits a response message to the SIP terminal 100.

The SIP server completes the registration process after receiving the response message from the SIP call server 200.

20 A method of registering an SIP terminal of an SIP based VoIP system having the above-described construction according to an embodiment of the present invention is described below with reference to FIG. 2.

In S1, the SIP terminal 100 transmits a first registration request message to the SIP call server 200.

25 Then, the SIP call server 200 transmits a user information request message to the SIP terminal 100, requesting the MAC address of the SIP terminal 100 in S2. The user information request message transmitted from the SIP call server 200 to

the SIP terminal 100 includes an identifier in the nonce of the "WWW-Authenticate" field.

In S3, the SIP terminal 100 transmits a second request message including its own MAC address to the SIP call server 200. The second registration request
5 message transmitted from the SIP terminal 100 to the SIP call server 200 includes the MAC address of the SIP terminal 100 in the user_name of the "Authenticate" field.

Next, the SIP call server 200 registers the SIP terminal 100 based on the second registration request message while storing the MAC address to be matched
10 to the registered SIP terminal, and then transmits a response to the SIP terminal in S4.

FIG. 3 is a block diagram of an SIP based VoIP system according to an embodiment of the present invention, in which the SIP terminal 100 of the SIP based VoIP system includes an SIP registration module including an SIP message
15 processor 210, an identifier discriminator 120 and a MAC address input unit 130.

After having transmitted a first registration request message to the SIP call server 200, when the SIP registration module of the SIP terminal 100 receives a user information request message requesting the MAC address of the SIP terminal 100, the SIP registration module of the SIP terminal 100 transmits the MAC address
20 of the SIP terminal 100 on a second registration message to the SIP call server 200 and then receives a response message, thereby completing the registration process for the SIP terminal 100.

The SIP message processor 110 in the SIP registration module of the SIP terminal 100 transmits the first and second registration request messages to the SIP
25 call server 200, and receives the user information request message and the response message from the SIP call server 200.

The identifier discriminator 120 in the SIP registration module of the SIP terminal 100 determines whether or not the user information request message received from the SIP call server 200 includes an identifier that requests the MAC address of the SIP terminal 100. That is, the identifier discriminator 120 in the SIP
5 module of the SIP terminal 100 determines whether or not an identifier exists in the nonce of the "WWW-Authenticate" field in the user information request message.

If an identifier exists in the user information request message, the MAC address input unit 130 in the SIP registration module of the SIP terminal 100 inputs its MAC address into the second registration request message. In this case, the
10 second registration request message transmitted from the MAC address input unit 130 to the SIP call server 200 includes the MAC address in the user_name of the "Authenticate" field.

First, the SIP message processor 110 in the SIP registration module of the SIP terminal 100 transmits a first registration request message to the SIP call server
15 200 as shown in FIG. 8A.

After that, the SIP message processor 110 in the SIP registration module of the SIP terminal 100 receives a user information request message from the SIP call server 200.

Then, the identifier discriminator 120 in the SIP registration module of the SIP terminal 100 determines whether or not an identifier "mac" (a) requesting the
20 MAC address of the SIP terminal 100 exists in the user information request message received from the SIP call server 200. That is, the identifier discriminator 120 in the SIP registration module of the SIP terminal 100 determines whether or not the identifier "mac-" (a) exists in the nonce of the "WWW-Authenticate" field in the user
25 information request message.

If the identifier discriminator 120 in the SIP registration module of the SIP terminal 100 determines that the identifier "mac-" (a) requesting the MAC address of

the SIP terminal 100 exists in the user information request message, then the MAC address input unit 130 in the SIP registration module of the SIP terminal 100 adds the MAC address "000447681cdd" (b) of the SIP terminal 100 into the "user_name" and adds the "UserA000447681cdd" into the second registration request message.

- 5 In this case, the second registration message, which the MAC address input unit 130 in the SIP registration module of the SIP terminal transmits to the SIP call server 200, includes the MAC address of the SIP terminal 100 in the user_name of the "Authenticate" field.

- 10 Then, the SIP message processor 110 in the SIP registration module of the SIP terminal 100 transmits the second registration request message including the MAC address of the SIP terminal 100 to the SIP call server 200.

After that, the SIP message processor 110 in the SIP registration module of the SIP terminal 100 receives a response message from the SIP call server 200 and thus completes an SIP registration process of the SIP terminal 100.

- 15 A method of registering an SIP terminal in an SIP based VoIP system in accordance with an embodiment of the present invention having the above-described construction is described below with reference to FIG. 4.

- 20 First, the SIP terminal 100 transmits a first registration request message to the SIP call server 200 and then receives a user information request message in S10.

- Then, in S20, the SIP terminal 100 determines whether or not the SIP call server 200 has requested the MAC address of the SIP terminal 100 based on the received user information request message. This is effected by determining whether or not an identifier exists in the nonce of the "WWW-Authenticate" field in the user information request message of the SIP terminal 100.
- 25

In this case, if it has been determined in S20 that the SIP call server 200 has requested the MAC address of the SIP terminal 100 (YES), then the SIP terminal

100 transmits user terminal information including the MAC address of the SIP terminal 100 on a second registration request message to the SIP call server 200 in S30.

Then, in S40, the SIP terminal 100 receives a response message from the
5 SIP call server 200 and completes registration.

If it has been determined in S20 that the SIP call server 200 has not requested the MAC address of the SIP terminal 100 (NO), then the SIP terminal 100 transmits user terminal information without the MAC address of the SIP terminal 100 on a second registration request message to the SIP call server 200 in S50. In this
10 case, the SIP terminal 100 adds the MAC address thereof in the user_name of the "Authenticate" field.

Then, in S60, the SIP terminal 100 receives a response message from the SIP call server 200 and completes registration in S60.

FIG. 5 is a block diagram of a method of registering an SIP call server in an
15 SIP based VoIP system according to an embodiment of the present invention. With reference to FIG. 5, an SIP call server 200 of the SIP based VoIP system has an SIP registration module including an SIP message processor 210, an SIP register and a MAC memory 230.

The SIP registration module receives a first registration request message
20 from the SIP terminal 100 and then transmits a user information request message to the SIP terminal, requesting the MAC address of the SIP terminal 100, and upon receiving a second registration request message including the MAC address from the SIP terminal 100, registers the SIP terminal 100 while storing the MAC address to be matched to the registered SIP terminal 100 and then transmits a response
25 message to the SIP terminal 100. In this case, the second registration request message received from the SIP terminal 100 includes the MAC address of the SIP terminal 100 in the user_name of the "Authenticate" field, and the user information

request message transmitted to the SIP terminal includes an identifier in the nonce of the "WWW-Authenticate" field.

In this case, the SIP message processor 210 in the SIP registration module, upon receiving the first registration request message from the SIP terminal 100, transmits the user information request message requesting the MAC address to the SIP terminal 100, and upon receiving the second registration request message including the MAC address from the SIP terminal 100, extracts the user information and the MAC address of the SIP terminal 100, and if the SIP terminal 100 is authenticated, transmits the response message to the SIP terminal 100.

Furthermore, the SIP register 220 in the SIP registration module registers the SIP terminal 100 based on the user information of the SIP terminal 100 extracted from the SIP message processor 210.

In addition, the MAC memory 230 in the SIP registration module stores the MAC address to be matched to an authentication key of the SIP terminal 100 authenticated by an SIP authenticator.

First, the SIP message processor 210 in the SIP registration module of the SIP call server 200 receives a first registration request message as shown in FIG. 8A from the SIP terminal 100.

In order for the SIP call server 200 to register the SIP terminal 100 together with MAC address of the SIP terminal 100, the SIP message processor 210 in the SIP registration module of the SIP call server 200 adds an identifier "mac-" (a) for requesting the MAC address as shown in FIG. 8B into a user information request message and transmits the user information request message to the SIP terminal 100. In this case, the identifier "mac-" (a) has to be added into the nonce of the "WWW-Authenticate" field in the user information request message, which the SIP call server 200 transmits, and has previously set in the SIP terminal 100.

Then, the SIP message processor 210 in the SIP registration module of the SIP call server 200 receives a second registration request message including the MAC address "000447681cdd" (b) as shown in FIG. 8C from the SIP terminal 100. In this case, the second registration request message received from the SIP terminal 100 includes the MAC address of the SIP terminal 100 in the user_name of the "Authenticate" field.

Then, the SIP message processor 210 in the SIP registration module of the SIP call server 200 extracts the user information and the MAC address of the SIP terminal 100. In this case, the SIP message processor 210 can extract the MAC address by comparing user_name's in the first and second registration request message.

Then, the SIP registration processor 220 in the SIP registration module registers the SIP terminal 100 based on the user information of the SIP terminal extracted from the SIP message processor 210.

Furthermore, the MAC memory 230 in the SIP registration module stores the MAC address to be matched to an authentication key of the SIP terminal authenticated by the SIP authenticator.

Then, the SIP message processor 210 in the SIP registration module of the SIP call server 200 transmits a response message as shown in FIG. 8D to the SIP terminal.

A method in which the SIP call server registers the SIP terminal in the SIP based VoIP system in accordance with an embodiment of the present invention having the above-described construction is described below with reference to FIG. 6.

First, the SIP call server 200 receives a first registration request message from the SIP terminal 100 in S100.

In S200, the SIP call server 200 transmits a user information request message to the SIP terminal, requesting the MAC address of the SIP terminal 100.

In this case, in order for the SIP call server 200 to acquire the MAC address of the SIP terminal 100, the user information request message includes an identifier "mac"-a in the nonce of the "WWW-Authenticate" field.

Then, the SIP call server 200 registers the SIP terminal 100 based on the
5 second registration request message received from the SIP terminal 100 while storing the MAC address to be matched to the registered SIP terminal 100, and then transmits a response message to the SIP terminal 100 in S300. In this case, the SIP call server 200 compares the user_name's of the "Authenticate" fields in the first and second registration request messages to confirm the MAC address of the SIP
10 terminal 100.

The above-mentioned step S300 is described below in detail with reference to FIG. 7.

First, the SIP call server 200 determines whether or not the received second registration request message includes the MAC address of the SIP terminal 100 in
15 S310.

If it has been determined in S310 that the MAC address of the SIP terminal has been included in the second registration request message (YES), then the SIP call server 200 determines whether or not the registered SIP terminal 100 (or its authentication key) exists based on the MAC address in S320. That is, the SIP call
20 server 200 can acquire "000447681cdd" (b) that is the MAC address of the SIP terminal 100 by comparing "UserA" that is "user_name" of the first registration request message with "UserA000447681cdd" that is "user_name" of the second registration request message.

If it has been determined in S320 that the registered SIP terminal 100 exists
25 (YES), then the SIP call server 200 transmits a response message to the SIP terminal 100 in S330.

If it has been determined in S310 that the MAC address of the SIP terminal 100 has not been stored in the second registration request message (NO), then the SIP call server 200 registers the SIP terminal 100 without storing the MAC address of the SIP terminal 100, and then transmits a response message to the SIP terminal 100 in S340.

On the other hand, if it has been determined in S320 that the registered SIP terminal 100 does not exist (NO), the SIP call server 200 executes registration by matching the MAC address of the SIP terminal 100 and then transmits a response message to the SIP terminal 100 in S350.

As described hereinbefore, the SIP based VoIP system and the method of registering an SIP terminal in the SIP based VoIP system of embodiments of the present invention can improve the registration authentication process for the SIP terminal in the VoIP system using a standard SIP so that the SIP server can effectively manage SIP terminals which are gradually increasing in number.

While the present invention has been shown and described in connection with the exemplary embodiments, it will be apparent to those skilled in the art that modifications and variations can be made without departing from the spirit and scope of the present invention as defined by the appended claims.

CLAIMS:

1. A Session Initiation Protocol (SIP) based Voice over Internet Protocol (VoIP) system, comprising:

5 an SIP call server and an SIP terminal;

the SIP call server adapted to transmit a user information request message to the SIP terminal to request a Media Access Control (MAC) address of the SIP terminal upon receipt of a first registration request message from the SIP terminal and to register the SIP terminal and store the MAC address to be matched to the registered SIP terminal upon receipt of a second registration request message including the MAC address from the SIP terminal, and to transmit a response message to the SIP terminal; and

10

the SIP terminal adapted to analyze the user information request message to determine whether or not to request the MAC address upon receipt of the user information request message after transmission of the first registration request message, and to transmit the MAC address thereof on the second registration request message to the SIP call server.

15

2. The VoIP system according to claim 1, wherein the second registration request message is adapted to add the MAC address thereof to a user_name of an "Authenticate" field.

20

3. The VoIP system according to claim 1, wherein the user information request message includes an identifier in a nonce of a "WWW-Authenticate" field.

25

4. A Session Initiation Protocol (SIP) terminal of an SIP based Voice over Internet Protocol (VoIP) system comprising an SIP registration module adapted to

transmit a first registration request message to an SIP call server upon receipt of a user information request message that requests a Media Access Control (MAC) address of an SIP terminal, to transmit a second registration request message including the MAC address of the SIP terminal to the SIP call server, and to receive
5 a response message therefrom to complete SIP terminal registration.

5. The SIP terminal according to claim 4, wherein the SIP registration module comprises:

an SIP message processor adapted to transmit the first and second
10 registration request messages to the SIP call server and to receive the user information request message and the response message from the SIP call server;

an identifier discriminator adapted to determine whether or not the user information request message received from the SIP call server has the MAC address of the SIP terminal; and

15 a MAC address input unit adapted to add the MAC address of the SIP terminal to the second registration request message upon an identifier existing in the user information request message.

6. The SIP terminal according to claim 4, wherein the second registration
20 request message includes the MAC address of the SIP terminal in a user_name of an "Authenticate" field.

7. The SIP terminal according to claim 4, wherein the user information
request message includes an identifier in a nonce of a "WWW-Authenticate" field.

25

8. A Session Initiation Protocol (SIP) call server of an SIP based Voice over Internet Protocol (VoIP) system comprising an SIP registration module adapted to

transmit a user information request message to an SIP terminal to request a Media Access Control (MAC) address of the SIP terminal upon receipt of a first registration message from the SIP terminal, to register the SIP terminal while storing the MAC address to be matched to the registered SIP terminal upon receipt of a second
5 registration message from the SIP terminal including the MAC address of the SIP terminal, and to transmit a response message to the SIP terminal.

9. The SIP call server according to claim 8, wherein the SIP registration module comprises:

10 an SIP message processor adapted to transmit the user information request message to the SIP terminal upon receipt of the first registration message from the SIP terminal, to extract user information and the MAC address of the SIP terminal upon receipt of the second registration message from the SIP terminal including the MAC address, and to transmit the response message to the SIP terminal upon the
15 SIP terminal being authenticated;

an SIP register adapted to register the SIP terminal based on the user information of the SIP terminal extracted from the SIP message processor; and

a MAC memory adapted to store the MAC address to be matched to an authentication key of the SIP terminal upon authentication of the SIP terminal by the
20 SIP register

10. The SIP call server according to claim 8, wherein the second registration request message includes the MAC address of the SIP terminal in a user_name of an "Authenticate" field.

25

11. A method of registering a Session Initiation Protocol (SIP) terminal in an SIP based Voice over Internet protocol (VoIP) system, the method comprising:

transmitting a first registration request message to an SIP call server from the SIP terminal;

transmitting a user information request message to the SIP terminal from the SIP call server, requesting a Media Access Control (MAC) address of the SIP terminal;

transmitting a second registration request message including the MAC address thereof to the SIP call server from the SIP terminal; and

registering the SIP terminal based on the second registration request message and storing the MAC address to be matched to the registered SIP terminal in the SIP call server, and transmitting a response message to the SIP terminal.

12. The method according to claim 11, wherein the user information request message transmitted from the SIP call server to the SIP terminal includes an identifier in a nonce of a "WWW-Authenticate" field in order to acquire the MAC address of the SIP terminal.

13. The method according to claim 11, wherein the second registration request message transmitted from the SIP terminal to the SIP call server includes the MAC address of the SIP terminal in a user_name of an "Authenticate" field.

20

14. A method of registering a Session Initiation Protocol (SIP) terminal in an SIP based Voice over Internet protocol (VoIP) system, the method comprising:

transmitting a first registration request message to an SIP call server and receiving a user information request message therefrom;

25 determining whether or not the SIP call server has requested a Media Access Control (MAC) address of the SIP terminal based on the user information request message received therefrom;

transmitting user terminal information including the MAC address of the SIP terminal on a second registration request message to the SIP call server upon a determination that the SIP call server has requested the MAC address of the SIP terminal; and

5 receiving a response message from the SIP call server to complete registration.

15. The method according to claim 14, further comprising:

transmitting user terminal information without the MAC address of the SIP
10 terminal on the second registration request message to the SIP call server upon a determination that the SIP call server has not requested the MAC address of the SIP terminal; and

receiving a response message from the SIP call server to complete
registration.

15

16. The method according to claim 14, wherein determining whether or not the SIP call server has requested a MAC address of the SIP terminal comprises determining whether or not an identifier is included in a nonce of a WWW-Authenticate field in the received user information request message.

20

17. A method of registering a Session Initiation Protocol (SIP) terminal by an SIP call server in an SIP based Voice over Internet Protocol (VoIP) system, the method comprising:

receiving a first registration request message from the SIP terminal;

25 transmitting a user information request message to the SIP terminal, requesting a Media Access Control (MAC) address of the SIP terminal; and

registering the SIP terminal based on a second registration request message received from the SIP terminal and storing the MAC address to be matched to the registered SIP terminal, and transmitting a response message to the SIP terminal.

5 18. The method according to claim 17, wherein transmitting a response message to the SIP terminal comprises:

determining whether or not the MAC address of the SIP terminal is included in the second registration request message received from the SIP terminal;

10 determining whether or not the registered SIP terminal exists based on the MAC address upon the MAC address of the SIP terminal being included in the second registration request message; and

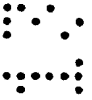
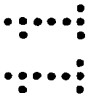
transmitting the response message to the SIP terminal upon a determination that the registered SIP terminal has been confirmed as existing.

15 19. The method according to claim 18, further comprising registering the SIP terminal without storing the MAC address of the SIP terminal upon a determination that the MAC address has not been included in the second registration request message, and transmitting the response message to the SIP terminal.

20 20. The method according to claim 18, further comprising conducting registration by matching of the MAC address of the SIP terminal upon a determination that the registered SIP terminal does not exist, and transmitting the response message to the SIP terminal.

25 21. Apparatus constructed and arranged substantially as hereinbefore described with reference to the accompanying drawings.

22. A method substantially as hereinbefore described with reference to the accompanying drawings.





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Application No: GB0622051.1**Examiner:** Mr Jared Stokes**Claims searched:** 1 to 22**Date of search:** 26 January 2007**Patents Act 1977: Search Report under Section 17****Documents considered to be relevant:**

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	GB2396073 A (Samsung) See abstract, figure 3
A	-	US2002/0131402 A1 (Lee et al.) See paragraph 24
A	-	US2006/0268829 A1 (Nedeltchev) See paragraphs 25-26

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category	P	Document published on or after the declared priority date but before the filing date of this invention
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application

Field of Search:Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X:

H4K

Worldwide search of patent documents classified in the following areas of the IPC

H04M

The following online and other databases have been used in the preparation of this search report

EPODOC, INSPEC, WPI

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ABSTRACT:

A Session Initiation Protocol (SIP) based Voice over Internet Protocol (VoIP) system comprises a SIP terminal (100, fig.5) and a SIP call server (200, fig.5). Upon receipt of a first registration request message from the SIP terminal, the call server transmits a user information request message to the SIP terminal to request a Media Access Control (MAC) address of the SIP terminal, and upon receipt of a second registration request

message including the MAC address from the SIP terminal, the call server registers the SIP terminal and stores the MAC address to be matched to the registered SIP terminal, and then transmits a response message to the SIP terminal confirming completion of the registration. In the second registration request message, the MAC address may be appended to the user_name of an "Authenticate" Field and may be obtained by subtracting the user_name of the first message from the second message. An identifier in a nonce of a "WWW-Authenticate" field may be included in the user information request message to indicate to the SIP terminal that its MAC address is requested.